

B<sup>8</sup> rate hours,] and replacing the charge capacity [is replaced] with the charge capacity in the preceding charge cycle.

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### REMARKS

Claims 1-33 are pending in the application. Claims 4, 6, 17 and 24 are hereby canceled. The specification is objected to under 35 U.S.C. §112, first paragraph, as failing to describe the apparatus. Claims 1-33 are objected to as containing informalities. Claims 1-33 are rejected under 35 U.S.C. §112, first paragraph, for the same reasons for which the specification is objected. Claims 1-33 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 1-6, 10 and 19 are rejected under 35 U.S.C. §102(b) as anticipated by Yang. Claims 7-9, and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yang in view of Martin. Claims 12-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yang, Martin and Decker. Claim 20 is rejected under 35 U.S.C. §103 as being unpatentable over Yang and Henderson *et al.* Claims 21-33 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yang, Henderson *et al.* and Chung *et al.* These rejections are respectfully hereby traversed.

Applicants acknowledge that all certified copies of the priority documents necessary to perfect the claim for foreign priority under 35 U.S.C. §119(a)-(d) have been received by the United States Patent and Trademark Office.

### Specification

Applicant hereby acknowledges that numerous changes to the specification were made by informal examiner's amendment as indicated in the Office Action mailed August 23, 1995 (paper no. 3). In response to the objection of the specification under 35 U.S.C. §112, first paragraph, this specification is hereby amended at page 11, line 3-4; and page 21, line 8 to describe the apparatus in full, clear, concise and exact terms. Regarding the figures which describe loads 1 and loads 5, the specification is hereby amended to refer to load 1 as "secondary battery load 1".

### **Claim Objections**

Claims 1-33 are objected to for various informalities. In response, the claims are hereby amended to correct these informalities.

### **Rejection - 35 U.S.C. §112**

Claims 1-33 are rejected under 35 U.S.C. §112, first paragraph, for the reasons set forth in the objection of the specification. In response, the specification is hereby amended to sufficiently support claims 1-33.

Claims 1-33 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. In response, the claims are hereby amended to address each of the bases for rejection presented. As amended, claims 1-3, 5, 7-16, 18-23 and 25-33 particularly point out and distinctly claim the subject matter which applicant regards as the invention.

### **Rejection - 35 U.S.C. §102**

Claims 1-6, 10 and 19 are rejected under 35 U.S.C. §102(b), as being anticipated by Yang. Specifically, the rejection is that "Yang discloses an intermediate storage battery charging system comprising: a secondary battery (103), connected to loads (105-1...n), a control device (107) . . . , rectifier (102) . . . , [and] a control scheme for control device (107) . . . ." <sup>1</sup> This rejection is respectfully traversed.

In response, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."<sup>2</sup> Claim 1 (once amended) recites "a signal line for transmitting information about said secondary battery through said detecting device to said control unit, wherein said control unit controls said charge/discharge unit on the basis of said information, wherein said information comprises measured values for determining surplus electric power stored in the secondary battery."

First, the timing device of Yang is dissimilar from the detecting device as claimed. The detecting device reads measured values which are transmitted through the detecting device.

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<sup>1</sup> Office Action mailed October 1, 1996 at 4-5.

<sup>2</sup> *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ 2d 1051,1053 (Fed. Cir. 1987).

The measured values, which are used to accurately calculate the residual charge capacity of the battery, "are measured by measuring devices and measured data is sent through the signal line to the controller 7 of the charge/discharge unit 2."<sup>3</sup> The measured values represent current, voltage and temperature data.<sup>4</sup> Accurate measurement of the residual energy in the battery is required to determine optimum charge/discharge conditions for secondary batteries of various types, i.e., lithium-ion, nickel-metal hydride, etc. For such batteries it is very important to control charge and discharge conditions to preserve the life of the battery.. The measurement devices of the present invention accurately measure the residual electrical energy in the secondary battery.

Yang, however, fails to teach or suggest a charge/discharge unit, which comprises a detecting device as claimed in claim 1 (once amended). In Yang, a "cyclic timing device 107 controls the application of AC source 101 to rectifier 102 and relay battery 103 . . . ."<sup>5</sup> Yang teaches that the "[c]yclic timing control device also senses the residual electrical energy already stored in intermediate storage battery 103 and controls charging in accordance" with the residual electric energy and the present time relative to the charge cycle.<sup>6</sup> As disclosed in Fig. 2 of Yang, the cyclic timing control device is a timer 117. Thus, in Yang, a residual electrical energy is measured by the period of time for which the battery is charged. However, for secondary batteries, as charge/discharge cycles are repeated, the characteristics of the secondary battery (maximum charge capacity, charge current, charge voltage, etc.) change.<sup>7</sup> Thus, it is impossible to accurately sense a residual electrical energy by means of a timing control device.

Second, Yang fails to teach or suggest a control unit which "controls said charge/discharge unit on the basis of said information" as claimed. According to the specification,

[t]he intrinsic optimum charge and discharge characteristics of the secondary battery, and the power demand of the plurality of loads or the power storage condition of the plurality of electric power storage units are measured and a

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<sup>3</sup> Specification at page 23, lines 30-32.

<sup>4</sup> See Specification at page 26, lines 15-31.

<sup>5</sup> Yang at col. 2, lines 20-22.

<sup>6</sup> Yang at col. 3, lines 18-39.

<sup>7</sup> Specification at page 24, lines 16-20.

load to which power is to be fed is selected. . . . For example, a load to which power is to be fed and the amount of power to be fed are determined selectively after examining power demand to see if the power demand can be supplied by the secondary battery and to see if the output current density (large-current discharge or small-current discharge) is appropriate to the secondary battery, and then the charge/discharge unit connects the secondary battery to the selected load to feed power to the latter by orders of the controller.<sup>8</sup>

In the case of the invention as claimed in claim 1 (once amended), power is directed from the secondary battery to either the secondary battery load or the power system by the charge/discharge unit depending upon the measured residual capacity of the secondary battery.

Yang, however, fails to teach or suggest a charge/discharge unit as claimed in claim 1 (once amended). In Yang, a "cyclic timing device 107 controls the application of AC source 101 to rectifier 102 and relay battery 103 . . . ."<sup>9</sup> "Cyclic timing control device also senses the residual electrical energy already stored in intermediate storage battery 103 and controls *charging* in accordance" with the residual electric energy and the present time relative to the charge cycle.<sup>10</sup> The timing control device merely estimates the residual charge in the intermediate storage battery to decide whether to deliver power to the battery during the charge cycle. [The timing control device does not have the ability to select a discharge load.] Also, the individual output control devices 104-1 . . . n are connected between the intermediate storage battery 103 and each of the external batteries 105-1 . . . n<sup>11</sup> and "include [various voltage, current, time, etc. devices] for detecting the saturation and/or polarity of the *charged external batteries* 105-1 . . . n."<sup>12</sup> Thus, in Yang the external batteries are connected to the intermediate battery depending on the charge characteristics of the external batteries rather than the optimum discharge characteristics of the intermediate storage battery.

Regarding the premise of the rejection that the method type limitations expressed in the last indented paragraph of claim 1 carry little weight,<sup>13</sup> note that the "wherein" clauses of claim 1 (once amended) are functional limitations of structural elements rather than method

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<sup>8</sup> Specification at page 13, line 32 through page 14, line 15.

<sup>9</sup> Yang at col. 2, lines 20-22.

<sup>10</sup> Yang at col. 3, lines 18-39 (emphasis added).

<sup>11</sup> Yang at col. 2, lines 61-63.

<sup>12</sup> Yang at col. 3, lines 58-65 (emphasis added).

<sup>13</sup> Office Action mailed October 1, 1996 at 5.

limitations. "There is nothing inherently wrong with defining some part of an invention in functional terms."<sup>14</sup> In fact, functional limitations "serve to precisely define present structural attributes of interrelated component parts of [a] claimed assembly."<sup>15</sup> Thus, claim 1 (once amended) definitely claims the present invention.

Therefore, because Yang fails to disclose a charge/discharge unit similar to the present invention as claimed in claim 1 (once amended), the invention as claimed is novel in view of Yang.

Regarding claims 2-6 and 10, the invention as claimed in these claims is also novel in view of the Yang because they include the detecting device limitation.<sup>16</sup>

Regarding claim 19, the rejection is that "[c]laim 19 basically says that when the charge on the secondary battery is above a certain value, the secondary battery serves the loads, and when the charge on the secondary battery is less than a certain value, the power supply serves the loads. The Yang reference expresses the same idea from a different perspective: at times of 'peak demand' the secondary battery serves the loads at times of 'non-peak demand' AC source serves the loads."<sup>17</sup> In response, Yang fails to disclose all of the limitations of the invention as claimed in claim 19 (once amended). Claim 19 (once amended) recites "a signal line for transmitting information about said secondary battery through said detecting device to said control unit" As noted above, Yang does not teach or suggest a detecting device similar to that claimed. Therefore, the invention as claimed in claim 19 (once amended) is novel in view of Yang.

### **Rejection - 35 U.S.C. §103**

Claims 7-9 and 11 are rejected under 35 U.S.C. §103 as being unpatentable over Yang in view of Martin. Specifically, the rejection is that while "Yang discloses the element described in the rejection of independent claim 1, Yang does not disclose a computer or indicating means. Martin discloses a computer programmed battery charge control system

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<sup>14</sup> MPEP § 2173.05(g).

<sup>15</sup> *In re Venezia*, 189 USPQ 149 (CCPA 1976); MPEP 2173.05(g).

<sup>16</sup> 35 USC § 112, fourth paragraph.

<sup>17</sup> Office Action mailed October 1, 1996 at 5.

comprising: means to measure current in and out of a battery, computer means to calculate residual charge and display means.”<sup>18</sup> This rejection is respectfully traversed.

In response, a case of *prima facie* obviousness has not been established because not all of the claim limitations are taught or suggested by the prior art.<sup>19</sup> As noted above, claim 1 (once amended) recites “a signal line for transmitting information about said secondary battery through said detecting device to said control unit, wherein said control unit controls said charge/discharge unit on the basis of said information.” Claims 7-9 and 11 include this limitation because they depend from claim 1.<sup>20</sup> Yang fails to teach or suggest a charge/discharge unit which controls discharging depending on the residual capacity of the secondary battery. In fact, Yang actually teaches away from a control device which controls discharge based on optimum discharge characteristics of the secondary battery wherein individual output control devices 104-1 . . . n are connected between the intermediate storage battery 103 and each of the external batteries 105-1 . . . n<sup>21</sup> to connect/disconnect the external batteries 105-1 . . . n to/from the intermediate storage battery 103. “The output control devices 104-1 . . . n are each shown to include [various voltage, current, time, etc. devices] for detecting the saturation and/or polarity of the charged external batteries 105-1 . . . n.”<sup>22</sup> Thus, Yang teaches that the external batteries are connected to the intermediate battery depending on the charge characteristics of the external batteries rather than the optimum discharge characteristics of the intermediate storage battery.

Similarly, Martin also fails to teach or suggest a charge/discharge unit which controls discharging depending of the residual power capacity of the secondary battery. Rather, as noted in the rejection, “Martin discloses a computer programmed battery charge control system comprising: means to measure current in and out of a battery, computer means to calculate residual charge and display means.”<sup>23</sup> While the system does give “a warning of extreme

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<sup>18</sup> Office Action mailed October 1, 1996 at 6.

<sup>19</sup> *In re Royka*, 180 USPQ 580 (CCPA 1974) (To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art).

<sup>20</sup> 35 USC § 112, fourth paragraph.

<sup>21</sup> Yang at col. 2, lines 61-63.

<sup>22</sup> Yang at col. 3, lines 58-65.

<sup>23</sup> Office Action mailed October 1, 1996 at 6.

discharge conditions,”<sup>24</sup> there is no teaching or suggestion of a control to discharge depending on the residual charge of the battery. In fact, the warning system of Martin teaches away from the present invention wherein “[t]he seven segment readout U12 displays ‘low battery’ condition by the letter L indicating that the battery is deeply discharged and is at or below a threshold of, for example, 20% of CAPRT, a warning that this state has been reached and requiring immediate recharge in order to avoid battery [sic] damage.”<sup>25</sup> Therefore, because Martin teaches that the battery should be recharged to avoid damage, rather than controlling discharge depending on the residual capacity, Martin fails to teach or suggest the invention.

Therefore, the present invention as claimed in claims 7-9 and 11 is nonobvious in view of the combined teachings of Yang and Martin.

### Rejection - 35 U.S.C. §103

Claims 12-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yang, Martin and Decker. Specifically, the rejection is that “Yang and Martin disclose the basic elements described in the rejection of claim 7 above. Although Martin discloses a computer responsive to voltage and current sense means on a battery, the reference does not explicitly show an A/D converter. In substantially the same context, Decker discloses an A/D converter for converting signals obtained from battery sense means.”<sup>26</sup> This rejection is respectfully traversed.

In response, a case of *prima facie* obviousness has not been established because not all of the claim limitations are taught or suggested by the prior art.<sup>27</sup> Claim 12 (once amended) recites “a control unit for controlling the charge/discharge unit on the basis of information from the secondary battery and at least one of the loads of the plurality of loads or at least one of the units of the plurality of electric power storage units . . . .” Similarly, claim 18 (once amended) recites a “charge/discharge unit . . . controlled by a controller on the basis of information received from the plurality of loads or the plurality of electric power storage units.

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<sup>24</sup> Martin at col. 1, line 30.

<sup>25</sup> Martin at col. 7, lines 6-11.

<sup>26</sup> Office Action mailed October 1, 1996 at 7.

<sup>27</sup> *In re Royka*, 180 USPQ 580 (CCPA 1974). (To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art).

...” Like Yang and Martin, Decker fails to teach or suggest a control of the discharge. Decker simply presents a method for controlling power supplied to a storage system by individually adjusting each panel in a solar panel array to produce appropriate power as desired.<sup>28</sup> Therefore, the invention as claimed in claims 12 and 18 is nonobvious in view of the combined teachings of Yang, Martin and Decker.

Further, the invention as claimed in claims 13-16 is nonobvious. If an independent claim is nonobvious under 35 USC § 103, then any claim depending therefrom is nonobvious.<sup>29</sup> Claims 13-16 depend from nonobvious claims 12. Therefore, the invention as claimed in claims 13-16 is also nonobvious in view of the combined teachings of Yang, Martin and Decker.

### Rejection - 35 U.S.C. §103

Claim 20 is rejected under 35 U.S.C. §103 as being unpatentable over Yang and Henderson *et al.* Specifically, the rejection is that while Yang discloses all of the elements of the invention as claimed in claim 1, “Yang does not disclose the method feature recited in the last “wherein” clause of claim 20, which basically says that the secondary battery is discharged prior to charging. Henderson *et al.* discloses a method and means for discharging a battery prior to charging.”<sup>30</sup> This rejection is respectfully traversed.

In response, a case of *prima facie* obviousness has not been established because not all of the claim limitations are taught or suggested by the prior art.<sup>31</sup> Claim 20 (once amended) recites “feeding power from the secondary battery to at least either a load of a plurality of loads or a unit of a plurality of electric power storage units, depending on the residual electric power, prior to charging said secondary battery.” As noted above, Yang does not teach or suggest controlling discharge conditions, much less feeding power from a secondary battery to a particular load depending on the residual electric power of the battery. Similarly, while Henderson *et al.* does teach discharging in two stages with different resistive loads,<sup>32</sup> it also

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<sup>28</sup> Decker at col. 2, lines 44-46.

<sup>29</sup> *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988); MPEP 2143.03.

<sup>30</sup> Office Action mailed October 1, 1996 at 7-8.

<sup>31</sup> *In re Royka*, 180 USPQ 580 (CCPA 1974). (To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art).

<sup>32</sup> Henderson *et al.* at col. 2, lines 60-69.



does not teach or suggest feeding power from the battery to a particular load depending of the residual electric power of the battery. In Henderson *et al.*, the battery is discharged rapidly to a first voltage level and then at constant current to a second, lower voltage.<sup>33</sup> This is done to reduce the stored power in the battery to a baseline, known amount. The battery is then charged at constant current for a controlled period of time to store an exact amount of power in the battery.<sup>34</sup> Henderson *et al.* actually teaches away from the invention as claimed in claim 20 (once amended) in that it feeds power from the battery to a first load and then feeds the residual power to a single load, rather than feeding the residual power to a load chosen from a plurality of loads depending on the residual power. Therefore, the invention as claimed in claim 20 (once amended) is nonobvious in view of the combined teachings of Yang and Henderson *et al.*

### Rejection - 35 U.S.C. §103

Claims 21-33 are rejected under 35 U.S.C. §103 as being unpatentable over Yang, Henderson *et al.* and Chung *et al.* Specifically, the rejection is that “Chung discloses a method for “load shedding,” which means selectively connecting the essential and non-essential loads to the battery based on information about the battery.”<sup>35</sup> This rejection is respectfully traversed.

In response, a case of *prima facie* obviousness has not been established because not all of the claim limitations are taught or suggested by the prior art.<sup>36</sup> As noted above, Yang and Henderson *et al.* do not teach or suggest feeding power from a secondary battery to a particular load depending on the residual electric power of the battery. Further, Chung *et al.* also fails to teach or suggest the invention as claimed in claim 20 (once amended). In fact, Chung *et al.* teaches away by suggesting that power not be discharged (“load shedding”) to particular loads depending upon the residual power of the battery. Battery powered spacecraft in orbit have essential power demands, i.e., attitude control systems, and nonessential power

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<sup>33</sup> Henderson *et al.* at col. 1, lines 55-65.

<sup>34</sup> Henderson *et al.* at col 2, line 71 - col. 3, line 3.

<sup>35</sup> Office Action mailed October 1, 1996 at 8.

<sup>36</sup> *In re Royka*, 180 USPQ 580 (CCPA 1974). (To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art).

demands, i.e., communications systems.<sup>37</sup> Because the spacecraft periodically passes around the dark side of the earth, the battery must provide power until the spacecraft again comes into contact with sunlight for solar power recharging of the batteries. The communication system "is shed when the battery system contains an amount of charge remaining that is sufficient to enable the spacecraft system to survive until a positive battery charging condition is achieved."<sup>38</sup> The system simply eliminates a group of loads as possible discharge units until the batteries are recharged. Therefore, Chung *et al.* fails to teach or suggest the invention as claimed in claim 20 (once amended).

The invention, as claimed in claims 21-23 and 25-33, is also nonobvious in view of Yang, Henderson *et al.* and Chung *et al.* If an independent claim is nonobvious under 35 USC § 103, then any claim depending therefrom is nonobvious.<sup>39</sup> Claims 21-23 and 25-33 depend from nonobvious independent claim 20 (once amended). Therefore, the invention as claimed in claims 21-23 and 25-33 is nonobvious in view of the combined teachings of Yang, Henderson *et al.* and Chung *et al.*

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<sup>37</sup> Chung *et al.* at col. 1, lines 18-47.

<sup>38</sup> Chung *et al.* at col. 1, lines 48-51.

<sup>39</sup> *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988); MPEP 2143.03.

### Conclusion

Claims 1-5, 7-16, 18-23 and 25-33 are pending in the application. The specification is hereby amended to overcome all objections and rejections. Claims 1-5, 7-16, 18-23 and 25-33 are hereby amended to overcome all 35 U.S.C. §112 rejections. The invention as claimed in claims 1-6, 10 and 19 is not anticipated by Yang. Further, the invention as claimed in the remainder of the claims is not obvious in view of Yang, Martin, Decker, Henderson *et al.* and Chung *et al.*, individually or in combination. Therefore, applicants hereby request withdraw of the rejections and allowance of all pending claims.

Respectfully submitted,

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